REMARKS

Favorable reconsideration of this application, in view of the present amendments and in light of the following discussion, is respectfully requested.

After entry of this amendment, Claims 22, 24-31, 35-37, and 39-42 are pending. Claims 22, 36-37, 42 are amended, and Claims 23 and 38 are canceled without prejudice or disclaimer. No new matter is introduced.[1]

In the outstanding Office Action, Claims 22 and 24-25 were rejected under 35 U.S.C. § 102(b) as being anticipated by Noguchi et al. (U.S. Patent Application Publication No. 2003/0001277, hereafter "Noguchi"); Claims 22-31 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Sugawara et al. (WO 2003/056622, hereafter "Sugawara") in view of Noguchi; Claims 22-25 and 37-41 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Takagi et al. (U.S. Patent No. 6,174,796, hereafter "Takagi") in view of Noguchi; and Claims 35-36 and 42 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Takagi and Noguchi in further view of Waldfried et al. (U.S. Patent No. 6,630,406, hereafter "Waldfried").

In response to the rejection of Claims 22 and 24-25 as being anticipated by Noguchi, Claim 22 is amended to recite, *inter alia*, a method for cleaning a surface of a conductive layer on a semiconductor substrate placed in a reaction chamber:

> wherein plasma containing hydrogen, helium and argon is generated in the reaction chamber, and the surface of the conductive layer is cleaned by being reduced therewith, and
>
> wherein a residual organic material on the surface of the conductive layer is ashed by the plasma *while the surface of the conductive layer is reduced.* (Emphasis added).

The applied reference, Noguchi, describes a semiconductor integrated circuit device and associated manufacturing methodology used in high-performance logic LSI.[2] More

[1] Non-limiting support for the amended claims can be found at least at page 10, lines 13-26 of the specification.

specifically, Noguchi describes that an element isolating groove (2) is formed by photolithography and dry etching in a semiconductor substrate (1), a silicon oxide film (3) is then deposited by CVD over the substrate (1), and the substrate (1) is then flattened by chemical mechanical polishing (CMP).[3] Noguchi also describes forming interconnection grooves (40-44) by selectively etching the silicon oxide film (39) using the silicon nitride film (38) as an etching stopper.[4] Copper interconnections (46a-46b) are then formed inside of the interconnection grooves (40-44).[5] Noguchi then describes that the copper interconnections (46a-46e) are subjected to an ammonia plasma to prepare them for formation of a thin nitride film (47).[6] The thin nitride film (47) is deposited on the copper interconnections (46a-46e) by treatment with a plasma of silane, ammonia and nitrogen.[7] Thus, the plasma treatments of Noguchi deposit material on the copper interconnections (46a-46e), which is different from ashing a residual organic material on the surface of the copper interconnections. In fact, Noguchi does not describe ashing any material, much less that a residual organic material on the surface of the conductive layer is ashed by the plasma *while the surface of the conductive layer is reduced*, as recited in amended Claim 22. Therefore, Noguchi fails to disclose every feature recited in amended Claim 22. Though amended Claim 22 was not rejected in view of Sugawara, Sugawara also does not disclose the claimed ashing. As such, amended Claim 22, together with its corresponding dependent claims, is believed to be in condition for allowance.

Further, Noguchi does not *require* that the substrate (1) be treated with a plasma of hydrogen, helium and argon. Instead, Noguchi lists this as merely one of many possible gas

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[2] Noguchi at page 1, paragraph [0008].
[3] Noguchi at page 8, paragraph [0058]; see also Figure 1.
[4] Noguchi at page 9, paragraph [0168]; see also Figures 6(a) and 6(b).
[5] Noguchi at page 9, paragraph [0169].
[6] Noguchi at page 11, paragraphs [0195]-[0198].
[7] Noguchi at page 11, paragraph [0200].

combinations used in the plasma.[8] This is because Noguchi is not concerned with cleaning the copper interconnections. However, as first recognized by the present inventors, the combination of features recited in amended Claim 22 synergistically combine in a new and fruitful manner to clean the conductive layer. Therefore, amended Claim 22, together with its corresponding dependent claims, is believed to be in condition for allowance for this additional reason. Accordingly, it is respectfully requested that the rejection of Claims 22, 24, and 25 under 35 U.S.C. § 102(b) be withdrawn.

As all other rejections of record rely upon Noguchi for describing the above-distinguished features, and the above-distinguished features are not disclosed or suggested by Noguchi, alone or in combination with any other art of record, it is respectfully submitted that a *prima facie* case of obviousness has not been presented. Accordingly, it is respectfully requested that the rejection of Claims 22-31, 37-41, 36, and 42 under 35 U.S.C. § 103(a) be withdrawn.

For the reasons discussed above, no further issues are believed to be outstanding in the present application, and the present application is believed to be in condition for formal allowance. Therefore, a Notice of Allowance for Claims 22, 24-31, 35-37, and 39-42 is earnestly solicited.

[8] Noguchi at page 2, paragraph [0023].

Should, however, the Examiner deem that any further action is necessary to place this application in even better form for allowance, the Examiner is encouraged to contact Applicants' undersigned representative at the below-listed telephone number.

Respectfully submitted,

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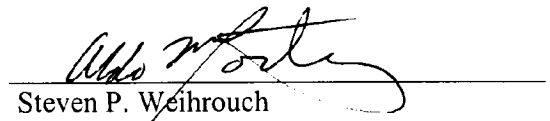

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